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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,628	08/01/2003	Bradley J. Howard	2269-5862US (02-1563.00/	4766

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EXAMINER	
DHINGRA, RAKESH KUMAR	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

C

Office Action Summary	Application No.	Applicant(s)	
	10/632,628	HOWARD, BRADLEY J.	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9 and 11-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9,1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1, 3-9 and 11-23 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended independent claims 1,16 by adding new limitation "the first, second and third power generators being frequency based power generators".

New refrence (US PGPB No. 2001/0009139 – Shan et al) when combined with Tsuchiya et al (US Patent 5,716, 534) and DeOrnellas et al (US PGPUB No. 2002/0139665) reads on the amended claims 1, 16 limitations including the newly added limitation "the first, second and third power generators being frequency based power generators". Accordingly independent claims 1,16 have been rejected under 35 USC 103 (a) as explained below. Dependent claims 3-9, 11-15, 17-23 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-9, 11, 13-17, 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (US Patent No. 5,716,534) in view of DeOrnellas et al (US Pub. No. 2002/0139665) and Shan et al (US PGPUB No. 2001/0009139).

Regarding Claims 1, 16, 17: Tsuchiya et al teach a plasma apparatus (Figures 1, 30-33) comprising a vacuum chamber 2, first RF power generator 29 (frequency based power generator) coupled to upper electrode 21 and second RF power generator 18 (frequency based power generator) coupled to lower electrode (susceptor) 4 with chuck 8, for holding a wafer W. Tsuchiya et al further teach a CPU (controller) 20 that can be configured to selectively control the activation configuration (in a step manner or continuously varying) of first and second power generators 29,18 during duty cycle of a process to enable optimize the etching process (column 4, line 45 to column 6, line 45 and column 12, line 5 to column 13, line 35).

Tsuchiya et al do not teach two power generators coupled to lower electrode.

DeOrnellas et al teach (Figures 1) two power generators 32, 34 coupled to lower electrode 28. DeOrnellas et al also teach that generators 32 is frequency based generator while generator 34 is a DC power supply (DeOrnellas et al – Paragraphs 0023-0025).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use two power generators coupled to lower electrode as taught by DeOrnellas et al in the apparatus of Tsuchiya et al to achieve enhanced plasma density so as to favourably affect the selectivity and control of etching process (paragraph 0005).

Tsuchiya et al in view of DeOrnellas et al teach two generators (one of which is a DC power supply) connected to lower electrode but do not teach that both these generators are frequency based generators.

Shan et al teach an apparatus (Figure 2) comprising of a plasma system wherein RF power is supplied by a dual output RF source 239 to bias electrode 215. Shan et al further teach that first RF supply 240 supplies RF signal to bias electrode 215. Shan et al also teach that instead of RF signal from RF source 240, a combination of DC and RF bias voltage may be applied to bias electrode. Shan et al teach

further that a portion of signal produced by second RF power supply 242 can be coupled to lower electrode (Paragraphs 0023-0030).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to replace DC power supply (third power generator) in DeOrnellas et al apparatus with a frequency based power generator as taught by Shan et al as an equivalent power supply for supplying bias power to the lower electrode.

Regarding Claims 3,4,20: Shan et al teach that power source (second generator) 240 typically operates at 13.56 MHz and second RF signal frequency (third generator) is 400 KHz (paragraphs 0027, 0029), that is frequency of second generator is at least three times that of frequency of third power generator. Further, DeOrnellas et al ('665) teach an RF power source 30 (frequency – 13.56 MHZ, and which can range upto 950 MHz) connected to upper electrode 26 (first power generator). Thus frequency of first power generator 30 is greater than frequency of second power generator 240 and third power generator 242 {DeOrnellas et al ('665) – paragraph 0023}.

Regarding Claims 5-9, 11: Tsuchiya et al teach all limitations of the claims including that apparatus (Figures 1, 30-33) uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (column 9, lines 1-15 and column 12, lines 45-65 and column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the parameters including phase difference and the power ratio of the generators (column 8, lines 20-25).

Regarding Claims 13, 21: Shan et al teach that power source 240 (second power generator) can operate at frequencies from 100 KHz to 2.45 GHz (includes the claimed range of 13.56 MHZ to 60 MHz). It would be obvious to select the desired frequency of second generator as per process limitations like etching parameters, ion density.

Regarding Claims 14,22: DeOrnellas et al teach that the first power generator 30 coupled to upper electrode 26 operates in the frequency range of 2 Mhz to 950 MHz which encompasses the claimed frequency range of 40 MHz to 100 MHz. It would be obvious to optimize the frequency as per requirement of density of etch plasma (paragraphs 0023, 0025).

Regarding Claims 15,23: Tsuchiya et al teach that power generator 18 (third power generator) operates at a frequency of 13.56 MHz, which anticipates the claimed frequency range of 1 MHz to 13.5 MHz (column 6, lines 1-10).

Claims 12, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (US Patent No. 5,716,534) in view of DeOrnellas et al (US Pub. No. 2002/0139665) and Shan et al (US PGPUB No. 2001/0009139) as applied to Claims 1, 16 and further in view of DeOrnellas et al (US Patent No. 6,492,280).

Regarding Claims 12,18,19: Tsuchiya et al in view of DeOrnellas et al ('665) and Shan et al teach all limitations of the claim including that first generator is capacitively coupled to upper electrode (Tsuchiya et al, Figure 1, Column 6, lines 1-30).

Tsuchiya et al in view of DeOrnellas et al ('665) and Shan et al do not teach second and third power generators are capacitively coupled to lower electrode.

DeOrnellas et al ('280) teach an apparatus (Figure 6) that has two AC power generators 48, 50 coupled to lower electrode 42 and where the second and third power generators 48, 50 are capacitively coupled to the lower electrode 42. DeOrnellas et al ('280) also teach that the apparatus could work as inductive or capacitive plasma apparatus (DeOrnellas et al '280, Figure 6, Column 7, lines 55-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use two AC power generators capacitively coupled to lower electrode as taught by DeOrnellas et al ('280) in the apparatus of Tsuchiya et al in view of DeOrnellas et al ('665) and Shan et al

to as per required process limitations like plasma uniformity and density (DeOrnellas et al {'280} – column 5, lines 1-65).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)..

Rakesh Dhingra

Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763